Technology Brief
Getac Power Management Technology

Getac

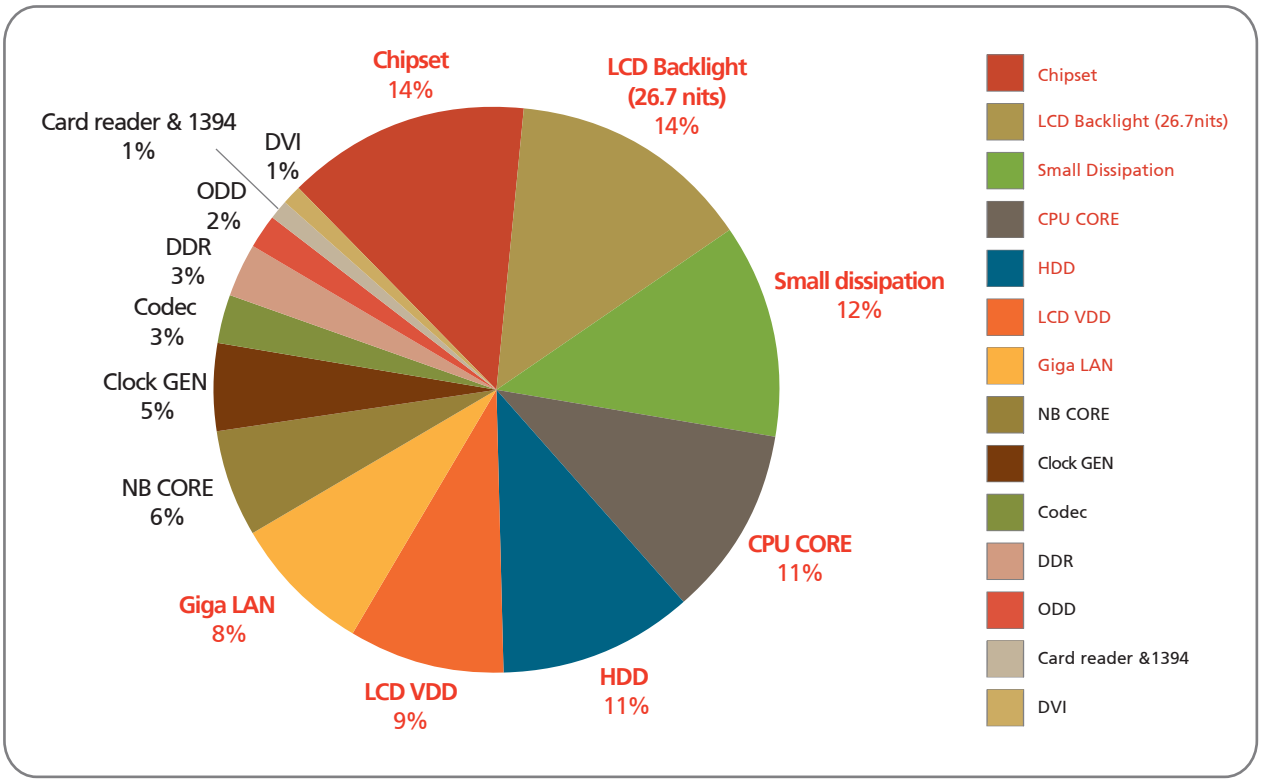
Technology Brief — Getac Power Saving Technology

Getac's Power Management Technology Achieves Next Level of Excellence for Rugged Mobile Computing Solutions

Power saving technology is increasingly important due to petroleum shortage and environmental protection issues. There is an urgent need to develop power saving technology in order to cater to the demand of end customers for longtime use of their mobile devices. Getac's research and development center has been diligently researching power saving technology for years, which not only enables a key selling feature for Getac's rugged mobile computing products but also represents our strong commitment to our home – the Earth.

Finding idle power consumption factors is the first step in our research, which helps us identify the major issues that we can focus on to improve the energy depletion of a system. In Figure 1, the pie chart shows the power depletion of an Intel Santa Rosa-based laptop, we outline major power depletion components such as LCD Backlight, Chipset, Small Dissipation, CPUCore, Hard Disk Drive (HDD) etc. The pie chart is derived when the system is running in heavy load mode. The sequence will subject to change as per different test conditions. In this case, the heavy load test will be proceeded through programs; such as Prime95, MPEG-2, AVI files and others, which are focused on CPU calculation, graphic performance. HDD, VGA and data bus burning in chipsets.

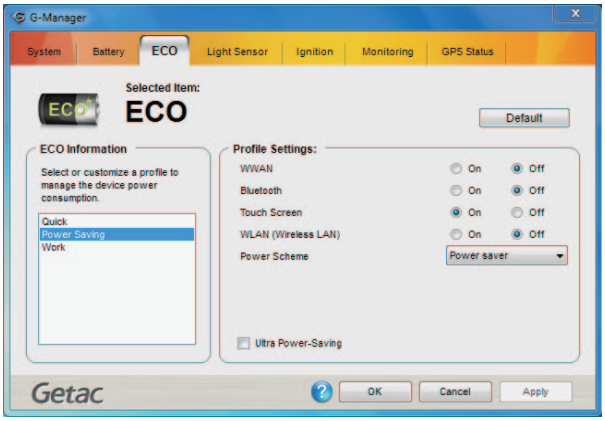
Classes of attributes of devices were analyzed based on the data collected. Currently, Getac has four key solutions for power saving system; they are power saving for static devices, power saving for dynamic devices, high accuracy power source design, and a demand-based power supply system.



[Figure 1] Power Depletion of Santa Rosa Platform

01 Power saving for static devices

For those plug-and-play (PnP) devices, that turning off power when they are not in use is basic approach for power saving. Getac's research and development center has integrated the resources of Hardware, Software, Driver and Application teams to develop a convenient, smart utility, G-Manager (Figure 2) to control the power of PnP devices. Users will be able to define power control mechanisms of such devices by themselves in order to optimize the utility to meet their requirements. G-Manager also provides the default "Ultra Power Saving" mode that helps turn off all PnP devices to enable ease in use.



[Figure 2] G-Manager

02 Power Saving for Dynamic Devices

In addition to PnP devices, collaboration among Hardware, Software, Driver and Mechanical engineers at Getac has developed technologies for fixed devices. As these devices are irremovable and do not offer random control, software must check the status of such devices by reading the registers in chipset or driver, while the embedded controller and BIOS are in charge of switching the devices on or off automatically based on device status.

A. Optical Disk Drive (ODD)

Turning off ODD directly will cause system errors. BIOS must check the status of ODD cyclically and determine the next step accordingly. The power of ODD will only be allowed to be turned off if no disk exists and idle after a setting time.

B. Hard Disk Drive (HDD)

HDD reports a different power control mechanism from that of ODD, linking to device driver layer for status check. BIOS sets ACPI Script Language (ASL) code to get the device status and take power-control actions.

C. LAN

Similar to Intel's Auto Connect Battery Saver (ACBS) technology, this is a more efficient power-saving method developed by Getac to turn off the LAN chip power completely. The circuit is compatible with 10MB, 100MB and 1GB network systems. An embedded controller (EC) will check the LAN cable status by the signal provided from the LAN signal detection glue logic. The glue logic will generate a logic low level signal periodically while the LAN cable is connected to a RJ45 connector and linked to the network, and the signal will keep logic high permanently if no LAN cable is connected. Chipset follows the information from EC to deal with bus isolation and initialization. Both EC and Chipset must work closely to enable the ACBS function. On the one hand, EC must get the grant signal from Chipset to make sure the bus is isolated and then turns off the LAN chip power of.

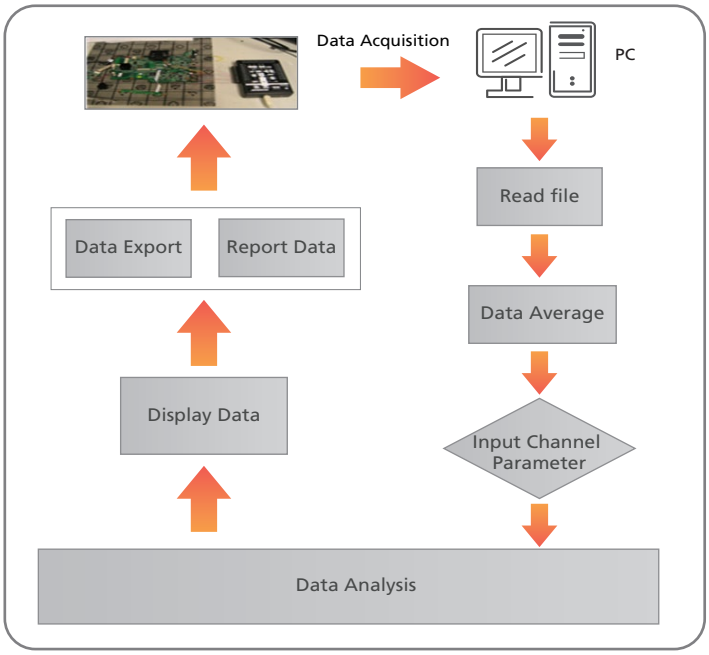
03 Accuracy power source design

Intrinsic static idle power consumption is the characteristic of semiconductor devices. No matter the system is in standby, sleep or power down mode, there will be a fix current to continuously deplete energy. Giving an equation $P = I \times V$, the P value will vary by V when the I value is fixed. The P value will decrease when V decreases. In most cases, engineers will increase the voltage from DC/DC output modestly to compensate the propagation loss and make sure the end point chips receive correct power supply. Getac engineers reduce the power propagation loss by improving the mother board PCB layout design technique and the stable DC/DC system design. By doing so, Getac engineers implement an accuracy power supply system that meets the requirement of chips and reduces unnecessary power depletion.

04 Demand-based power supply technology and Automatic Power Measure and Analyze system

How do we achieve a demand-based power supply? A demand-based power supply system shall only provide adequate energy to the mother board. An over -designed DC/DC will increase the bill of material (BOM) cost while insufficient DC/DC design will reduce efficiency and cause energy to convert to heat, and lead to more energy consumed for cooling purpose eventually. A fully-satisfactory power design not only helps save costs but also increase the power module design efficiency to lead to more power saving.

Designing an adequate DC/DC power supply module is always a challenge to engineers. It is because some sub-portions of DC/DC that generated by other high voltage DC/DC will make it difficult to identify the instant power requirement of all sub-DC/DC at the same time, particularly the CPU core voltage, which changes frequently Designing an adequate DC/DC power supply module is always a challenge to engineers. It is because some sub-portions of DC/DC that generated by other high voltage DC/DC will make it difficult to identify the instant power requirement of all sub-DC/DC at the same time, particularly the CPU core voltage, which changes frequently because of the CPU power saving technologies, e.g. the SpeedStep® technology of Intel and PowerNow!TM technology of AMD. It is also hard to clarify the relation between each DC/DC module as not all peak current of each DC/DC will happen at the same time. In other words, the real power budget can't be obtained through DC/DC measurement one by one. The measurement shall take place simultaneously and be accumulated for a long time until the system is balanced to get correct data.



[Figure 3] Structure of APMA System

The Auto Power Measure and Analyze utility (APMA) will automatically calculate the data latched from the data acquisition equipment and output useful information such as maximum current, maximum power, average current, average power etc...And also, the APMA can export the data to Microsoft Excel format files for further use. For Getac new launch and under development product, Designers are using this APMA system to diagnose the power plane design in each stage (EVT/DVT/PVT).

Power saving technology can effectively help reduce the system heat, where a cool system will help reduce the problem caused by thermal issue with more power saved to deal with the thermal. It is indeed, a positive loop and a significant progress for us. Getac will keep developing advanced power saving technology in the future.

Value for Customers

- Enabling outdoor applications, particularly essential to mission critical use in outdoor environment without power.
- Strong engineering design, test & manufacturing capabilities that help customers differentiate themselves from their rivals in the vertical marketplace.

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